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Balancing conflicting demands: factors influencing vets' choice of antimicrobial agent

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Background

Antimicrobial resistance (AMR) is a major threat to both human and animal health ^{1,2}. Antimicrobial stewardship, also referred to as prudent or responsible antimicrobial use (AMU), by veterinary surgeons is a central strategy to prevent development of AMR ³. In order to define responsible use, it is useful to identify the different stakeholder groups involved, and to identify their primary responsibilities in relation to AMU. The phrase “as little as possible, as much as necessary” is used frequently to summarise the conflict between public and private interests that lies at the heart of efforts to combat antimicrobial resistance. The primary responsibility at a population level is to protect human and animal health by restricting the use of antimicrobial agents in order to minimise the development of resistance – i.e. as little as possible. Conversely, the primary responsibility of the vet is to safeguard the health and welfare and optimise the productivity of their clients' animals i.e. as much as necessary ⁴. Prudent AMU in animals and humans therefore involves a trade-off between these competing demands in order to select an antimicrobial that will be clinically effective while also minimising the risk of AMR ^{5,6}. “As little as possible, as much as necessary” is used most commonly in relation to the quantity of antimicrobials used, but can also be taken to refer to qualities of the drug chosen, in terms of their potential to drive clinically relevant resistance. Each antimicrobial agent is rated as “important”, “highly important” or “critically important”, which relates to its clinical importance ⁷.

The factors influencing vets' decisions about prescribing antimicrobial agents in pig production have been explored using both qualitative ^{8–10} and quantitative ^{11–13} approaches. Eriksen and colleagues¹⁴ have built upon this existing knowledge by quantifying and comparing the influence of the factors identified in previous studies on the choice of antimicrobial in the specific context of intestinal diseases in weaner pigs in Denmark, providing a valuable insight into how vets balance the competing considerations that they face when selecting an antimicrobial agent. Eriksen and colleagues selected intestinal diseases in weaners as their focus as one of the major clinical scenarios driving AMU in Danish pig production. While it cannot be assumed that their findings will apply to vets' choice of antimicrobial agent across other clinical presentations, species, production systems and countries, their findings mirror those of a previous study conducted across seven other European countries ¹², indicating that there are common factors.

“As much as necessary” factors

Clinical factors were found by Eriksen and colleagues to have the greatest effect on the choice of antimicrobial by vets. Personal experience of the efficacy of the chosen drug, both within that specific herd and other herds, and observation of clinical signs were rated as more influential than the results of microbiological diagnosis and susceptibility testing. A previous study also found antimicrobial susceptibility testing to have limited influence on the choice of antimicrobial ¹⁵. Danish regulations requires susceptibility testing to be performed before group-level treatment is permitted. The relatively low levels of testing, with only 16.2% of respondents reporting that all of

their herds had been tested within the last year as required, were somewhat surprising. It may be that these herds are not treating groups of weaners with antimicrobials – a previous study found that 10-20% of Danish weaner pig herds do not use batch treatment (Jensen and others 2017). The limitations of current susceptibility tests in terms of time and cost are barriers to their use, which could be addressed by the development of quicker and cheaper tests in the future (De Briyne and others 2013).

The vets surveyed identified the route of administration as the most important consideration relating to the practicalities of administering the selected antimicrobial on farm. Factors relating to the farmer, such as their treatment preference, presumptive diagnosis and degree of compliance, were all considered to be relatively unimportant. Pressure from farmers has been identified as a driver for veterinary antimicrobial prescribing⁸, but was not found to be a particularly strong influence in this study. However, the herd manager's perception of clinical efficacy was considered to be important, linking with the strong influence of clinical factors.

“As little as possible” factors

Efforts by regulatory bodies to support prudent AMU are based on mandatory regulations and advisory information and guidelines. The Yellow Card Initiative was launched in 2010 in an effort to curtail rising AMU in the Danish pig sector and has resulted in an overall reduction in use¹⁶. Eriksen and colleagues describe how later changes to the initiative now promote use of less critically important antimicrobials, and found that the Yellow Card Initiative was a strong influence on the choice of drug among their respondents. However, the Danish Food and Veterinary Administration's Evidence-based Prudent Use Guidelines were found to be relatively unimportant in comparison. It is perhaps to be expected that mandatory regulations with tangible penalties for non-compliance have a greater influence on prescribing decisions than advisory guidelines. As identified by Eriksen and colleagues, the guidelines were scored as more important by vets who spend a lower proportion of their time on pig work, suggesting that they are more valuable to vets with less clinical experience of pigs.

As with prudent use guidelines, Eriksen and colleagues found that most external sources of information were not considered to be particularly influential on the choice of antimicrobial, with the notable exception of vets' knowledge from their education. This finding indicates that veterinary education has a critical role to play in supporting prudent AMU in future generations of vets. Despite the lack of weight given to most information sources, the respondents were aware of the central messages around the risk of AMR and did consider these factors when selecting a drug. “Risk of development of antimicrobial resistance” and “importance of the antimicrobial for human use” were among the most important of the “other” factors, indicating that these issues are taken into consideration, but were considered to be less influential than clinical factors. Higher perceived risk of AMU by farmers is associated with lower levels of usage in several European countries¹⁷, and this result suggests that a similar effect could be observed among Danish pig vets.

Conclusions

The results of the study by Eriksen and colleagues demonstrate that vets place greater importance on their clinical judgement than on regulations and guidelines when selecting which antimicrobial to use, and that direct clinical observation is considered to be more influential than the results of diagnostic testing on the choice of antimicrobial. A recent study in human medicine, utilising a game theory approach, reached a similar conclusion: for individual doctors making prescribing decisions, the risk of harm to their patients outweighs the broader risk to society of AMR¹⁸. The practical

implication for combatting AMR is that regulation is necessary to tip the balance of individual decisions in favour of reducing AMR⁵. Eriksen and colleagues' findings suggest that compliance with regulations designed to combat AMR is more likely if vets and farmers have effective alternative strategies available, such as the use of lower priority antimicrobials, and have direct experience of the clinical efficacy of these alternatives. The availability of antimicrobial alternatives that are practically acceptable in an on-farm setting has been shown to reduce overall use¹⁹. It is possible to achieve high performance in pig herds with low AMU^{20,21} and evidence which demonstrates that it is similarly possible to use lower priority antimicrobials without compromising health, welfare and productivity would be of value. Policy development to restrict AMU in order to combat AMR must ensure that vets and farmers have effective, alternative strategies available to manage disease and protect the health and welfare of the livestock under their care.

What you need to know

- Vets rate their own clinical judgement as more important than external regulations and information when selecting an antimicrobial.
- On-farm observations and direct clinical experience have a greater influence on the choice of antimicrobial than the results of microbiological diagnosis and sensitivity testing.
- Veterinary education has a crucial role to play in supporting prudent AMU in the future.
- Policy development which restricts AMU to combat AMR must ensure that vets and farmers have effective, alternative strategies available to manage disease and protect the health and welfare of livestock.

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